

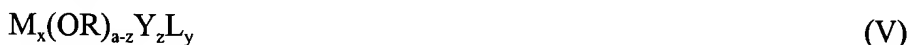
WHAT IS CLAIMED IS:

1. An atomic layer deposition process for growing thin oxide films on a surface of a substrate comprising alternately reacting the surface of the substrate with a metal source material and an oxygen source material, wherein the oxygen source material is a boron, silicon or metal compound which has at least one organic ligand and wherein an oxygen is bonded to at least one boron, silicon or metal atom.

2. A process according to Claim 1, wherein the oxygen source material serves as a second metal source material.

3. A process according to Claim 1, wherein the substrate for the film is a silicon surface.

4. A process according to Claim 1, wherein the oxygen source material used is a compound according to gross Formula II - V



wherein

M is any metal of the Periodic Table of the Elements, boron and/or silicon, the M's may be mutually the same or different.

x is an integer describing the number of M atoms, which number may be 1, 2, 3 or 4,

R is a hydrocarbon group, the R's may be the same or different,

a is the valence (sum of valences) of the metal(s), boron and/or silicon M,

z is an integer 1 - 6, in which case $a - z > 0$,

Y is a ligand having a negative charge, but not an alkoxide,

L is a neutral adduct ligand which bonds to M by one or several of its atoms, and

y describes the number of the bonding ligands.

5. A process according to Claim 4, wherein the metal M is selected from the group consisting of group 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 of the Periodic Table of the

Elements, boron, aluminum, silicon, gallium, germanium, indium, tin, antimony, thallium, lead, bismuth, and polonium.

6. A process according to Claim 4, wherein R is a substituted or unsubstituted, cyclic, linear or branched group selected from the group consisting of an alkyl, alkenyl, aryl, alkylaryl, arylalkyl, alkoxy, thio, amino, cyano, and a silyl group.

7. A process according to Claim 6, wherein R is a linear or branched C₁-C₁₀ alkyl.

8. The process according to Claim 7, wherein R is selected from the group consisting of an ethyl, propyl, isopropyl, butyl, *tert*-butyl and an isobutyl group.

9. A process according to Claim 4, wherein the ligand Y is selected from the group consisting of a diketonate, a corresponding sulfur or nitrogen compound, an alkyl, a perfluoroalkyl, a halide, a hydride, an amide, an alkoxide, a carboxylate, a Schiff base, and a cyclopentadienyl group or its derivative.

10. A process according to Claim 4, wherein R is selected from the group consisting of a methyl, an ethyl, a propyl, and an isopropyl group.

11. A process according to Claim 4, wherein the ligand L is selected from the group consisting of:

- (i) a hydrocarbon,
- (ii) an oxygen-containing hydrocarbon,
- (iii) a nitrogen-containing hydrocarbon,
- (iv) a sulfur-containing hydrocarbon,
- (v) a phosphorus-containing hydrocarbon,
- (vi) an arsenic-containing hydrocarbon,
- (vii) a selenium-containing hydrocarbon, and
- (viii) a tellurium-containing hydrocarbon.

12. A process according to Claim 11, wherein L is selected from the group consisting of:

- (i) an amine or polyamine,
- (ii) a bipyridine
- (iii) a ligand described by the formula



(VI)

in which formula G is -O-, -S- or -NR¹, wherein R¹ is hydrogen or a substituted or unsubstituted, cyclic, linear or branched, alkyl, alkenyl, aryl, alkylaryl, arylalkyl, alkoxy, thio, cyano or silyl group, and each carbon atom of a ring according to the formula has an R¹-like substituent, which are mutually either the same or different,

- (iv) an ether or polyether, an
- (v) a thioether or polythioether.

13. A process according to Claim 1, wherein the oxygen source material is selected from the group consisting of an alkoxide, a β -diketonate, a triketonate, a tropolonate, a carboxylate, an ester, a quinone, a catecholate complex, a carbamate, and a compound having two or more of these groups together with any metal of the Periodic Table of the Elements.

14. A process according to Claim 1, wherein the oxygen source material is an orthoquinone complex.

15. A process according to Claim 11, wherein the oxygen source material is a metal alkoxide.

16. A process according to Claim 1, wherein the metal source material is a compound with the formula M'^bX_b, where

M' is any metal of the Periodic Table of the Elements, boron or silicon,

b is the valence of M', and

X is a negatively charged ligand, each X being, independent of the others, where X is selected from the group consisting of a halide (F, Cl, Br, I), a hydride, an alkylamide NR₂, an alkoxide, an aryloxide, an alkyl, a cyclopentadienyl, and a β -diketonate.

17. A process according to Claim 1, wherein the metal source material is selected from the group consisting of an alkyl compound, a metal halide, and a metal alkoxide.

18. A process according to Claim 1, further comprising treating the substrate to remove the native oxide from the surface of the substrate before the growing of the film.